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*Hints on the Antiseptic Management  
of Wounds*

BY

FRANCIS M. CAIRD, M.B.

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# HINTS ON THE ANTISEPTIC MANAGEMENT OF WOUNDS:

“ LISTERISM.”

BY

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## NOTE.

THE following compilation is an attempt to give a short account of the Appliances, and method of using the Appliances, in the Antiseptic System of treatment of Wounds.

It is not purposed here to give a resumé of the great facts on which the Antiseptic System is based, nor yet of the reasons which have induced Surgeons everywhere to employ antiseptic management in some form or other, but it is hoped that there will be enough to guide the Student to a correct mode of using the materials at his disposal.



## THE ANTISEPTIC MANAGEMENT OF WOUNDS.

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THE practice of true Antiseptic Surgery, Listerism as it has been termed, *i.e.*, the keeping of a wound aseptic from first to last, requires not only a perfect understanding of the principles on which the treatment is based, but also a careful consideration of the means employed to gain that end, and a thorough knowledge of the difficulties to be met with. This can only be obtained by practice and experience ; and gradually the slips and inaccuracies which may at first occur disappear, and we become educated up to the necessary standard of excellence, so that what we tried to attain formerly by unremitting attention and zeal, we now gain almost instinctively and without effort. For a full account of the antiseptic treatment, we must seek the fountainhead in Lister's writings ; and accordingly a list of these and other useful papers bearing on the subject is appended.

Our first duty will be to consider the various antiseptics at present made use of. The main qualities required in an antiseptic are convenience, cheapness, and, of necessity, efficiency.

Carbolic acid so fulfils all these points, that it still retains its position at the head of the list, Mr. Lister himself having given up the use of thymol after a

thorough trial. Carbolic acid, further, is volatile—a property essential to any antiseptic in use as a spray. The best form of acid to employ is the Absolute Phenol of Messrs. Bowdler and Bickerdike—price 6s. 9d. per lb. Its advantages are, that it has no objectionable odour, is readily soluble, and does not irritate the operator's skin; while the more crude and impure forms met with are occasionally so disagreeable and harsh, that some of the German surgeons anoint their hands with vaseline before beginning work, in order to obviate this inconvenience.

Among the various preparations of carbolic acid we may first take up the SOLUTIONS—

There are two watery solutions—strong and weak. The strong consists of one part of the acid crystals in twenty parts of water. It is used for washing and purifying the skin and instruments, for keeping sponges, drainage tubes, and horse-hair soaking in, and for the steam spray.

The weak, which is half the strength of the strong (one part of the crystals in forty parts of water) is required for washing the sponges during an operation, for soaking the “deep dressing” in, and in dressing generally.

The Lotions should be filtered after being made, and had better be kept in large blue glass stoppered jars, carefully labelled.

An Alcoholic Solution of the strength of one part of the acid in five of spirit of wine, is employed for rendering those wounds aseptic which are seen a few hours after receipt of injury, and specially for those cases in which dirt and foreign matter has obtained access to the tissues.

There are two Oily Solutions. The weak, of one part of the crystals in twenty parts of olive oil, is used for

purifying and lubricating urethral bougies, sounds, and catheters, immediately previous to their introduction ; the strong, of one part crystals in ten of oil, may be applied to exposed dead bone in septic cases. A piece of lint soaked in the oil is laid on the necrosed part, and covered with a piece of gutta-percha tissue.

ANTISEPTIC GAUZE is prepared by changing unbleached muslin of open texture with the following mixture\* :—

Crystallised carbolic acid	.	.	.	1 part.
Common resin	.	.	.	5 parts.
Solid paraffin	.	.	.	7 „

This last prevents adhesiveness. Paraffin does not blend at all with carbolic acid in the cold, and therefore simply dilutes the mixture of carbolic acid and resin, without interfering in the least with the tenacity with which the resin holds the acid.

The carbolised gauze, as prepared in the Royal Infirmary, Edinburgh, costs the establishment a little under three halfpence per yard : it is retailed, however, to the public at a much higher rate in the shops.

The prepared gauze is used for the large superficial dressing, for bandages, and in loose pieces for padding and dressing irregular surfaces ; and also when wet wrung out of 1-40 aqueous solution for the “ deep dressing.”

The acid is only given off in sufficient quantity when the gauze is moist and at the temperature of the human body.

MACKINTOSH consists of thin cotton cloth having a layer of india-rubber waterproofing on one side. This should be evenly applied and continuous, so that the material is

\* New formula—*Lancet*, Dec. 1879—Carbolic acid, 1 part ; common resin and paraffin, of each, 4 parts.

quite impervious. There must be no pin holes in it. It is used to place over the superficial dressing of gauze, as shall be described hereafter.

PROTECTIVE is made of oiled silk, coated on both sides with a thin layer of copal varnish, which renders the silk impervious to the carbolic lotion. Over this again a fine layer of carbolised dextrine is laid, which allows the 1-40 lotion into which the protective is dipped immediately before use to wet, and so thoroughly purify the surface. The protective is neither aseptic nor yet antiseptic, hence the necessity for making it so before application. Its action is thus purely negative. It keeps the edges of the wound clean, moist, and free from the irritating action of the antiseptic dressing employed; allows discharge to escape readily from under it into the dressing; does not adhere, and so is easily removed when necessary.

CARBOLISED CATGUT is thus prepared. To twenty parts of carbolic acid crystals add two parts of water, and to this again add one hundred parts of olive oil. Place this mixture in a flask, and in this put several skeins of catgut. These should be kept above the level of the watery deposit which falls by means of a few glass marbles or rods. Seal the flasks hermetically, and set them aside in a cool place. The gut should not be used until five or six months after this, and the longer it has been prepared the better.

CARBOLISED SILK is prepared by immersing a reel of silk in melted bees' wax, containing about one-tenth part of carbolic acid. The silk is drawn through a dry cloth as it leaves the hot fluid, to remove the superfluous wax.

All these various requisites should be kept by them-

selves, apart from all other dressings ; the gauze in a tin box, the silk in a stoppered glass jar ; sponges, drainage tubes, and horse-hair, in wide-mouthed jars of 1-20 lotion, and the gut in its oil.

The various forms of STEAM SPRAYS employed are constructed on the principle of Adam's steam inhaler. The boiler should be strong, dome-shaped, and furnished with a safety valve. It is filled by an aperture, situated at the lower level of the dome, so that in filling the boiler space is left clear for steam alone. It is a disadvantage when the boiler is filled at the very summit, for in hospitals sufficient care is often not exercised, the steam dome is encroached upon, and a jet of boiling water is thus thrown out in place of spray.

The steam pipe, provided with a stop-cock and ball-joint, passes forwards from the top of the dome, and ends in a fine point, through which the steam rushes with great force.

United to the under surface of the steam point, at an angle of forty-two degrees, we have the carbolic point continuous with the upper extremity of the india-rubber tube which leads up from the reservoir of 1-20 lotion.

As the steam rushes out over the carbolic acid point it creates a vacuum, and the lotion thus sucked up is driven off in a fine cloud of vapour, which covers an area large enough for any ordinary operation, and which is quite respirable, not wetting, and effective at a distance of at least four feet.

On arriving at a patient's house, we fill the spray with boiling water up to the base of the dome, never above this, and so we avoid the danger of having the upper point blocked by particles of dust carried along in the

jet of water which would ensue were the boiler overfilled. We light the lamp, noting that the wick is in good order, and that there is a sufficiency of spirit ; and, should the lamp be arranged for a double flame, we must see that the wick is in proper position to keep the large flame at full strength.

We judge that steam is up, if it escapes with great force, and if it has a distinctly blue colour when we shut off all the carbolic acid, which may readily be done by compressing the carbolic tube with the fingers, and so seeing steam alone.

One has also the peculiar rushing sound, the smell and taste of the spray to guide them in ascertaining if all is in working order.

A small filter, formed of a small piece of fine sponge, inserted into the lower extremity of the carbolic tube, and secured in position by means of a gauze cap, will prevent the lower point from getting choked with dirt, which, falling into the open jar of acid, may be sucked up and so cause trouble. This filter must be changed or cleaned occasionally.

Should the spray cease working, we may unscrew the points, and affix the reserve pair found in the hollow handle, the wound being protected by a "guard," that is, a rag or piece of muslin or gauze soaked in lotion, and laid over the exposed part. In this way operative procedure is not hindered, and the defaulting points may be seen to and cleaned out with a horse-hair or fine silver wire at some future time. This is an accident which hardly ever occurs in private practice.

The other antiseptics employed may now be discussed.

A solution of chloride of zinc, forty grains to an ounce



of distilled water, was introduced by the late Campbell de Morgan. It is chiefly used to brush over the cut lips of incisions and wounds in regions which we cannot hope to keep aseptic, as in excision of the upper jaw or lateral lithotomy. We may leave our dressing of strips of lint soaked in this lotion unchanged for forty-eight hours, so potent is the salt; and in this way, thanks to its searching character and non-volatility, the pain and unrest of dressing is avoided, and a dangerous period, during which blood poisoning from absorption might take place, is tided over. Considerable smarting and pain ensue after application, and this continues for a varying period, according to the temperament of the patient. The use of chloride of zinc for purifying ulcers will be referred to shortly.

BORACIC, or rather BORIC ACID, is used as lotion, lint, and ointment. It is non-volatile, very unirritating, in fact the least so of all antiseptics, but is not at all searching. It may prevent, it can hardly eradicate putrefaction. The lotion of one part of the crystals in thirty parts of water is coloured red with litmus, and thus at a glance we may distinguish it from other lotions. It is used for moistening the boric lint and for washing sores.

The lint is prepared by soaking ordinary surgeon's lint in a boiling saturated solution of boric acid, coloured red with litmus. It is allowed to cool, the lint is hung up to dry, and the remaining fluid poured off and used as boric lotion. The lint is of a pink hue, and glitters with the soft flat micaceous crystals. In a similar manner we may change bibulous paper, or the paper lint introduced by Messrs Wyeth, of Philadelphia. We moisten the boric lint with boric lotion before application, and this for the same reason as we also soak the

deep dressing of gauze or the protective in carbolic lotion. The surface of the material may be covered with germs of all kinds, because the antiseptic is not acting. We destroy these organisms by our active lotion, and as the aseptic discharge finds its way afterwards into the dressing, it dissolves and sets free quite enough of the stored up agent to render it also antiseptic.

Boric ointment may be prepared by rubbing up one part of finely levigated boric acid in five parts of vaseline. It acts as a sort of antiseptic protective, and is specially useful in the treatment of wounds in the face, where it allows the discharge to escape, keeps the wound sweet, and never adheres.

An emulsion of salicylic acid in 1-40 carbolic lotion was introduced by Mr. Lister for the purpose of checking the chemical changes which may take place under dressings which have been left unchanged for some time. These changes, due to a chemical action between the gauze and the discharges under it, the sweat, &c., give rise sometimes to a troublesome irritation and eruption, formerly dubbed *excema carbolicum*. A very little salicylic cream smeared on the surface of the protective or deep dressing effectually disposes of this.

Let us now consider the application of these materials, and let us imagine the removal of a tumour from the region of the groin, as one would see this operation performed in a public hospital, with plenty assistants. As this is one of the regions where the surgeon's care and ingenuity are specially taxed in keeping his wounds aseptic, it serves as a good example of the style of dressing required.

On the surgeon's right stands the table with instruments and dressings. The gentleman who has charge



of these arranges his instruments in a flat shallow porcelain tray, containing enough 1-20 carbolic lotion to cover them. A sheet of india-rubber may be laid in the bottom of the tray, so that the bistouries cannot have their edges turned by coming in contact with the hard porcelain.) The duties of the instrument clerk comprise attention to the surgical cleanliness of the forceps, saws, and other necessities. These must be free from dirt and their teeth thoroughly purified. Needles, sutures, and instruments must be carefully carbolised and passed to the surgeon through the cloud of spray.

On the surgeon's left is located the table, with sponges basins, and lotions. (The dresser here removes as many sponges as he may require from the jar of 1-20, in which they are kept soaking, and places them for use in a basin half filled with 1-40 lotion.) A second basin with a similar quantity of 1-20 is next provided, and into this he puts a couple of towels and one sponge.

The spray clerk takes his position where the spray can throw a suitable cloud over the field of operation without incommoding the surgeon, obstructing the view of the spectators, or obliging the patient to respire the antiseptic. His duty is to replenish the spray-bottle with 1-20 as required ; to see that doors and windows are closed, so that no draught may undo all by blowing the spray cloud from off the wound. If ether is used as the anæsthetic, we must give it a wide berth, for fear of the flame of the lamp causing an explosion.

The patient being now quite anæsthetised, the dresser hands the surgeon the basin with the 1-20. The skin over and around the tumour is then well swabbed with the sponge ; the two towels, after having the superfluous

lotion squeezed out of them, are laid, the one over the genitals and the other so as to overlap the blanket which covers the upper part of the patient's body. (In this way a sort of antiseptic basis is provided over which the spray plays, and on which we may lay sponges and instruments with safety during the operation.) If necessary, the pubis may be shaved, and this, together with a preliminary purification, may be done before the patient leaves the ward.

(The surgeon now washes his hands in the lotion—not a mere dip as if he were afraid to carry the smell away with him, but a thorough cleansing,) especially around the flexures and finger-nails.) The basin of 1-20 is then held, during the operation, close to the vicinity of the wound, so that the assistants may purify their hands, or any instruments should they inadvertently be carried beyond the area of the spray.)

The spray is now turned on, and the operation proceeds. (The sponges are passed as required, wrung out of 1-40 lotion, and, as the dresser receives the dirty ones, he squeezes them into a pail standing at hand, then washes them in the 1-40 lotion, and wrings them dry as wanted. When the sponges are required very quickly, a relay may lie on the towel covered by the spray, but on no account should we have a store of them lying exposed to the air before passing; one simply courts failure by so doing.)

(The ligatures may be cut as required; the surgeon is not at liberty to have a stock attached to his button-hole, or to carry a dozen in his mouth, and yet claim to carry out most rigid antiseptic precautions.)

The tumour has now been removed; the bleeding checked by ligatures which are cut short: we have now

to close the wound, prevent tension, and keep it aseptic. Tension is abolished by the use of Chassaignac's drainage tubes, catgut, or horsehair drains. The tubes are introduced to the bottom of the wound; their number and size can only be learned by experience; but the drainage cannot be too free. Their outer ends must be flush with the level of the wound, and the two loops of silk turned back at right angles over the lips of the incision, and thus the tubes cannot slip back into the cavity they drain. It is sometimes preferable to introduce the tubes after stitching up. The tubes act usually by capillarity in such a case, the serum finding its way out between the clot and the walls of the tube; hence there is no advantage in keeping the tubes clear. The disadvantage of the tube is, that we must dress the wound at times solely to shorten or remove the tubes, when otherwise things need not have been disturbed.

The catgut drain requires much care and discrimination in its use. It is serviceable in cases where we feel there will not be sufficient stimulus of any kind to cause suppuration; for, while it drains away serum readily, it cannot convey pus. The catgut is slowly disintegrated and absorbed by the tissues, and thus requires no assistance in its removal; hence those dressings are avoided which we must make in order to shorten or remove tubes when those are employed.

The drains should be formed of eight or twelve ply of gut tied in the middle; and here we stitch it to the bottom of the wound with gut also, so that it may not be floated up to the top, acting as a mere superficial drain, and leaving material to accumulate in the deeper parts and cause tension. The two free ends of the drain may be brought out at the extremities of the incision, or

divided into three or four parts, which are brought out between the stitches. Tubes and drains may be combined as the surgeon sees fit, or he may use the tubes for the first two dressings, then insert drains instead, and look no more at the wound until such time as he hopes to find all healed, with the unabsorbed ends of the cat-gut lying on the top of the cicatrix. This we may readily carry out whenever the discharge is purely serous and small in quantity.

He now proceeds to close the wound. If it should be large and gaping, we get good results by the use of deep sutures, stitches of relaxation or button sutures. A stout silver wire is carried through the integument, about two inches or so beyond the incision, brought out at the wound, reintroduced and pulled out through the skin at a similar distance on the other side. The end of the wire has a flat leaden button or plate attached to it; and, as the wire is now pulled tight and the superfluous wire with the needle attached cut off, a second button is slipped on and the wire secured to it.

These buttons hold the lips of the wound together in the same manner as one's fingers would act. Immediate union is now favoured by the introduction of numerous secondary stitches of coaptation. For these horse-hair is preferable on account of its strength, elasticity, pliability, cheapness, and the ease with which it can be removed. It will be found advantageous to double the first twist of the reef knot, and thus there will be no danger of the stitch relaxing while the final twist is being made.

If one hair is not strong enough, we may use two or three together.

It is hardly necessary to add that all those sutures

and needles must be duly purified, nor must the ligatures, &c., be allowed to touch any septic body as they are passed to the surgeon in the spray.

The whole operation has now been conducted under the spray antiseptically; we have now to maintain this aseptic condition. For this purpose the dressing is applied. It may be prepared beforehand. The surgeon lays a strip of protective, newly dipped in the 1-40 carbolic lotion, over the lips of the wound, so that they are completely covered; and with advantage we may also lay small pieces over the end of the drains, silk of tubes and button stitches, these latter pieces being to prevent the gauze from adhering.

We now apply the deep dressing, and to understand its value we must bear in mind that dry carbolic gauze is not antiseptic. It gives off its acid at ordinary temperatures in such a small quantity, and so slowly, that it is not even aseptic; hence were we to apply dry gauze to recent wounds they would certainly in many cases putrefy. But we get over this difficulty by the use of a wet deep dressing, consisting of three or four ply of gauze, wrung out of 1-40 lotion, laid over the protective, and extending for three or four inches beyond it all round. In this way we have destroyed any organisms which may have fallen on the surface of the gauze; the aseptic discharge is received by the active carbolic acid in the deep dressing, is there rendered antiseptic, and by the time it reaches the large superficial dressing of dry gauze—which has now to be applied—the heat of the body has liberated so much of the acid that there is now no danger of the discharge putrefying.

After the deep dressing has been put in, we may pad any hollows with dry gauze, and perhaps put a special pad

in that region towards which discharge will gravitate. Over this is then laid the large superficial dressing, consisting of eight ply of gauze, with a sheet of mackintosh interposed between the seventh and eighth layers. One should note that the glazed surface must always be turned inwards, looking towards the skin, and that it is slightly smaller than the square of the gauze, so that it cannot protrude beyond it for fear of so infecting the discharge or screening it from view.

When the discharge soaks through the gauze, it is at length arrested by the mackintosh; it then makes its way towards the margin of the dressing, taking with it in its course so much carbolic acid that any organisms adherent to the polished surface of the mackintosh are destroyed.

If there be a very copious flow of discharge, it is possible that all the carbolic acid may be washed out, and hence the necessity for always changing a dressing for the first time within twenty-four hours after the operation. The dressing is secured by turns of a gauze bandage—these, from the manner in which they cling and adhere, from their softness and pliability, being very serviceable. Whenever the four corners of the dressing are secured, then the spray may cease. Further security is gained by fastening the bandages to the four corners of the dressing with safety pins; and then the bandages to one another only where they cross. On no account allow a pin to perforate the mackintosh.

For restless patients, and in cases which require dressing but once a week or less, a broad elastic bandage over all gives both patient and surgeon much comfort, as any chance of the dressing slipping is thus almost completely avoided. The patient now lies undisturbed for the next



four-and-twenty hours, when we change the dressing for the first time. We now require a deep and superficial dressing as before, and the dresser has also in readiness protective, a basin containing 1-40 lotion, deep dressing, and two rags, one of fine texture known as a guard, and a second coarser to swab with.

The spray is seen to be in order and in position. The surgeon now removes the pins and elastic, cuts the gauze bandage, and washes his hands in the lotion; the patient, if necessary, assisting meanwhile by keeping a hand on the dressing to keep it steadily in position. The spray is turned on, and the surgeon proceeds to lift up that corner of the dressing which is nearest the spray, so that the cloud may be directed into the angle between the dressing and the skin. The deep dressing and protective are now similarly removed, and we may gently wipe up any serum which may obscure our view of the wound. Should we desire to ascertain if there is retained discharge, we cover the wound with the web guard, and then make use of gentle pressure with the fingers. The guard effectually protects the wound should the spray cease working, or should any current of air turn the cloud aside; and again it is a matter of the greatest moment to have only purified air in the vicinity when we relax pressure, as a regurgitation into the wound must ensue. The new protective is now dipped and applied, the deep and superficial dressings follow as before.

And now the question arises, When are we to dress again? This is settled either by length of time, as dressing should not be left on for more than about twelve days, or by appearance of discharge at the edge of the dressing. The discharge is best seen as a stain on the clean draw-sheet on which the patient lies, and

the nurse has strict injunctions never to change the draw-sheet until it has been examined by the surgeon at daily visit.

It will be found that we no longer require to dress frequently, that intervals of three, four, and more days may elapse, until finally we find all healed. The event of any abnormal circumstance, as a rise of temperature, pain, or discomfort, even although minus discharge, will oblige us to dress without delay.

At these future dressings it will be necessary to attend to the drainage tubes and stitches. The tubes should be shortened to the extent of about a quarter or half an inch, according as they are seen to be pushed out by the contraction of the tissues around them ; and, frequently, they must not only be shortened, but we must substitute others of smaller calibre in their place or use catgut drains—points which can only be ascertained by experience. The removal of stitches should present no difficulty. As regards button sutures, the surgeon seizes one button with his forceps, and gently pulls it upwards, at the same time passing a strong pair of scissors beneath, so that as soon as the slightly curved portion of the wire has been withdrawn from the skin he may divide it. The other button and wire may now be withdrawn easily and painlessly.

When we open an abscess we must proceed as before to purify the skin and surroundings. The incision made should only be large enough to admit the drainage tube or the finger previously carefully cleansed, if it be deemed necessary to explore the cavity. Protective is not necessary.

In the case of psoas and lumbar abscesses, where the patients are long in bed, we must shorten the tubes slowly and carefully, never losing patience. A puckering



in of the lips of the wound points to a contraction of the tissues, and indicates that all is going well.

It may now be noticed that, as regards *aseptic* wounds, never once have we flushed them with carbolic acid; never once have we employed a syringe. Our whole aim has been to admit as little as possible of the irritating antiseptic to our wounds; we use it merely to act on external agents, our wounds being left as it were subcutaneous, the protective keeping out the carbolic acid, and the dressing acting like the healthy skin in preventing the entrance of putrefactive organisms; so that all our efforts are directed against the organisms contained in the medium to which the wound is exposed: it is the atmosphere not the wound which must be rendered aseptic.

What are the symptoms and signs that enable us to say we have failed in our object? The symptoms are many; individually no one is absolutely certain; collectively they are so. Of signs we have but one, and this one, plus a few of the symptoms, enables us to say that our wounds are or are not septic.

The chief symptoms shown by the patient are those of general or local constitutional disturbance, such as rise of temperature, inflammation of the wound and suppuration; and, as regards the dressing, we at once note that it stinks, and that the protective has become blackened by the sulphuretted hydrogen of putrefaction acting on the litharge with which the protective is prepared.

The occurrence of *all* the above would at once lead us to state that our purpose had failed. The occurrence of any *one* of them would only rouse our suspicion that all was not well, and would lead us to search for the special cause at work.

Thus the rise of temperature might yield to a dose of

castor oil ; the local redness and pain might subside on dividing a tight stitch which was giving rise to tension, or yield on the introduction of a drainage tube ; the suppuration might cease on removing some foreign body causing irritation by its presence, such as a scale of dead bone ; the stink of the dressing would come to an end when we applied a little salicylic acid ; and the blackening of the protective might be due to the use of india-rubber drainage tubes prepared with sulphur.

Any of the above symptoms combined with the one certain sign, the presence of *living moving bacteria*, at once enable us to state that we have failed, when the sooner we resort to open treatment with antiseptics the better. We may ascertain the presence of bacteria best by examining a little discharge removed at the time of dressing from the *under* surface of the protective, for here we find the organisms, if any are present, more lively, and so better marked than under the gauze. A power of 350 is enough, and we need not be disturbed by the appearance of clustered oil granules, or indulge in a vain hunt for micrococci, since it has been abundantly demonstrated that the latter have nothing whatsoever to do with putrefaction ; we look only for well-marked bacteroidal rods. (See paper by W. Watson Cheyne, *Lancet*, 17th May 1879.)

Septic cases we may divide into two classes—*Recent*, embracing fractures and wounds, which, having been exposed to the air, are liable to become putrid before long ; and secondly, chiefly *Joint Diseases*, old standing, with broken skin and sinuses.

As regards the former, let us imagine a fracture of the leg due to a crush—the bone protrudes and is dirty, the accident occurred a few hours ago. Hæmorrhage has been controlled by means of a tourniquet.

We expose the wound under the spray, and at once attempt to convert the compound into a simple fracture. The skin is purified with 1-20 lotion, which is also injected into the recesses of the wound by means of a gum elastic catheter attached to a syringe.

In this way the wound is thoroughly washed out, but care must be taken not to use the syringe forcibly, otherwise we may injure healthy tissue, the acid may be sent up the sheaths of tendons, and so sloughing will ensue. The protruding piece of bone is scrubbed with a nail brush dipped in 1-5 alcoholic solution, so that the dirt which has been rubbed into it may be rendered completely inert. The bones are now laid in position, the vessels secured with carbolised gut, drainage tubes inserted, and the dressing put on, the limb being left with the most suitable form of retentive apparatus applied externally. Within the next forty-eight hours we shall learn from the behaviour of the wound whether our efforts have been successful or not. Future dressings follow the ordinary rules.

In scalp wounds we purify the wound and surrounding skin with 1-20 carbolic acid, cutting the hair close, insert a catgut drain, and stitch up. Such cases are remarkable for their rapidity of healing, the troubles of erysipelas and inflammation being quite unknown among a class of out-patients who are not the most attentive.

Let us now deal with an old standing putrid joint case, complicated with sinuses. Our first duty is to remove all the putrid tissues we can, and this we endeavour to attain by scraping out the loose lining granulations from the sinuses with one of Volkmann's sharp spoons. In this way we hope to get rid of the unhealthy septic material, and leave behind only sound aseptic

tissue. The sinuses are now injected with the chloride of zinc solution, and the operation continued as if with unbroken skin, a final purification with the zinc salt being made use of before the dressing is applied.

In dealing with ulcers we first purify the skin with 1-20 lotion, and then the ulcer itself is rubbed with a piece of lint saturated with the chloride of zinc. A piece of protective of the same shape as the sore, and about an eighth of an inch larger all round, is then dipped in Boric lotion to purify it, and applied ; while over this again we lay two layers of Boric lint wrung out of the lotion. The lint must overlap the protective for an inch all round, at the very least ; and in cases where a copious discharge is anticipated, a special pad of the lint may be applied at the most dependent part to receive it. A bandage from below upwards completes the dressing, and the patient keeps the limb at rest until such time as discharge shows itself. Then a new dressing is reapplied ; we wash the sore and adjoining skin with Boric lotion, dip the protective and lint in clean lotion, and proceed as before.

The chloride of zinc causes a good deal of smarting and uneasiness, but the subsequent abolition of pain and smell is so marked, that, should the ulcer again become putrid, patients often request a second application of the solution.

We may also purify our ulcers by sprinkling them with powdered Iodoform, after washing with 1-20 carbolic lotion, and dress as above.

The pain caused by the zinc may be avoided, and the ulcer purified, by using several poultices of Boric lint ; that is to say, apply the layers of moist lint, and over them a larger sheet of gutta-percha, and then bandage.

Continue this treatment for some days, and then dress with protective and lint.

Boric acid being a very mild non-volatile and non-penetrating antiseptic, is only suited for superficial wounds. It is, however, the least irritating antiseptic we possess.

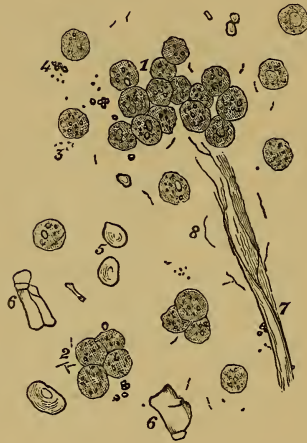
In private practice one finds the carrying out of antiseptic detail even less troublesome than in hospital. The spray is not so liable to get out of order, since it never changes hands. We do not make use of so many assistants, nor yet have we the convenience and benefit of bystanders to consider.

The surgeon may carry in his spray bag a small supply of crystals of carbolic acid, so that he has practically a great quantity of lotion in a very small space; he has also sponges; but the dressings and lotion are usually found in readiness at the patient's house. While the patient is being anæsthetised, one gets the spray in order, arranges instruments and dressings. The spray, during the operation, stands on a small table in a convenient position, and requires but little attention. Should the carbolic lotion in the spray bottle become exhausted, or should it be necessary to shift the position of the spray, then the surgeon merely lifts his guard out of the lotion, covers the wound with it, and then puts things to rights. Instruments may lie on a large plate or in a tumbler of water, their points being saved by coming in contact with a cake of india-rubber laid over the bottom.

Sponges of course are taken in hand by an assistant or nurse.

The future dressings are managed as in hospital. A daily visit is not required, since by means of a post-card the patient may send word to the surgeon should discharge appear, or any discomfort be experienced.

Scrapings from the Under-surface of the Protective in a  
Case of Putrid Whitlow.



- |   |  |
|---|--|
| 1. Pus Corpuscles.  | 6. Fragments of Copal<br>Varnish from the Pro-<br>tective.         |
| 2. Bacteria.  |  |
| 3. Micrococci. (?)  | 7. Cotton thread from the<br>Gauze, with detached<br>Filaments, 8. |
| 4. Fat Granules.  |  |
| 5. Starch Cells from the Dex-<br>trine of the Protective. |  |

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Hartnack, objective 7; Eyepiece 3; Tube drawn out.



## APPENDIX.



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